

# Daily GLOWBUGS

## Digest: V1 #51

via AB4EL Web Digests @ SunSITE

**Purpose: building and operating vacuum tube-based QRP rigs**

[AB4EL Ham Radio Homepage @ SunSITE](#)

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%%%% GlowBugs %%%% GlowBugs %%%% GlowBugs %%%% GlowBugs %%%%

**Subject: glowbugs V1 #51**

**glowbugs**

**Thursday, June 5 1997**

**Volume 01 : Number 051**

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Date: Tue, 3 Jun 1997 20:20:24 -0700 (PDT)

From: John Kolb <jlkolb@cts.com>

Subject: Re: High voltage in a PC power supply (was: Re: Electrolytic caps. needed...)

On Tue, 3 Jun 1997, Murray Kelly wrote:

> I wonder if one could put the output (5V) into another  
> SMPS transformer back to back, thus creating an isolation  
> type trf? You'd need another old SMPS, of course to  
> supply the 2nd trf.  
> That way you'd get the full 300V and not run the risk  
> of fiddling with live chassis?

You mean connecting the 5 V AC, 50 kHz square wave directly to the LV secondary winding of a near identical transformer, right? Should work pretty well. I hate to work on switching power supplies without a proper schematic, and that's very hard to get for computer parts.

>

> How about modulating the 5V, even?

>

Probably a little tricky to modulate the 5V AC, but the switching regulator circuit should have a reference input, that you could transformer couple audio into to modulate.

John Kolb KK6IL

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Date: Tue, 03 Jun 1997 23:01:54 +0100

From: BOB DUCKWORTH <bob@atl.org>

Subject: Another neat RX.

No I didn't build it but am very happily working on someone elses HBR-16. The Home Brew Receiver 16 tubes article from the Oct '59 QST appears to have gotten someone so fired up that he had it built before

the Dec QST and the 5763 product detector mod.

If the Mosley CM-1 description bored you, stop reading now.

The Mosley had 5 tubes (actually 10 as there was a triode and pentode in every one of them).

This HBR-16 has 16 tubes (actually 17 if you count the one 12AU7, 2 x triode as two).

I don't know about RX design so I'm gonna ask some questions and hopefully some will be kind enough to post what they know so I can get this thing running in top form.

Circuit starts with a 6BJ6 Pentode as RF amp. Plug in coils for each band. Antenna link coupled to grid coil which is tuned by one of three sections of the 5-23mmf/section VFO cap. RF gain via cathode bias pot.

Mosley manual said triode amp is better on high bands owing to noise considerations. Real feature or just making what they used look good?

Output of the RF amp is coupled the same way (link to tuned grid) of the first mixer 6CB5. Plug in coils are used here too with tuning by another section of the VFO cap.

Any suggestions as to least aggravating approach to making sure all these plug in coil based tuned circuits track well?

The VFO, a 6BH6 is tuned by the third section of the VFO cap and also uses a plug in coil. VFO feeds 1st mixer via same grid as RF amp.

How to determine best VFO injection level?

Output of first mixer is 1600kc and makes it's way to the second mixer 6BC5 via a link coupled, double tuned, transformer wound on a pill bottle.

Here I'm curious as to how to determine whether or not the amount of coupling I have is right, too much, or not enough. Would a 1600kc xtal (there is one in the junk box) be too tight as a filter or attenuate the signal too much at this stage of the RX?

The second mixer gets its' LO from a 1700KC 6C4 xtal osc. and is sampled through a 100kc double tuned IF transformer (Miller 612-M1) by the 6BJ6 first IF amp. Mixer gain via cathode bias pot.

Again, how to decide what injection level for 1700Kc signal is best.

Deja-vu, the second IF amp which is followed by the third of the triplet of transformers. The newly shaped IF signal is then routed to either a 6BE6 product detector or 1/2 of a 12AU7 double triode as envelope detector. Both IF gains are via one cathode bias pot.

As an operator, what is a good way to tell how much IF gain is enough.

BFO comes from a 6BH6 with Miller 012-M5 BFO coil and running as electron coupled osc.

Injection level question again.

The other half of that 12AU7 samples the output of the IF string and controls gain of the two 2nd IF stages for AVC and also drives the 6CB6 'S' meter amp.

Audio from either of the two detectors is amplified by a 6C4 driving headphones of a 6AQ5.

Hey, that's only 15 tubes! Well there is also a 6BH6 xtal osc running all by it's lonesome to provide a cal. signal.

So there. A bunch of gain distribution and injection level questions about a 37 year old radio. I'm all ears.

- -bob

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Date: Tue, 3 Jun 1997 22:52:53 -0500  
From: bill@skeeter.frco.com (William Hawkins)  
Subject: outer limits of 12AX7

Anybody out there with a working Tektronix 570 curve tracer for tubes? There's been a discussion of tube ratings following the discovery that some handbook said a 12AX7 was good for 7.5 watts dissipation. Most other books disagree, but the 12AU7 is good for 5+ watts with both sections dissipating half that.

Several people said you must not go beyond the limits, but I wonder what happens when you do. Suppose reduced life was acceptable. Now what are the limits? What kind of current can you pass without melting something, or going too non-linear? Does the hot tube degrade rapidly from outgassing? After all, there are all these stories about getting high power from an oil-cooled metal 6L6.

Hey, I've never run a 12AU7 with color in the plates. I've got no idea what happens. I suggested the 570 because that'd give the facts.

Regards,  
Bill Hawkins bill@skeeter.frco.com

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Date: Tue, 3 Jun 1997 21:28:54 -0700 (PDT)  
From: Ken Gordon <keng@uidaho.edu>  
Subject: Re: outer limits of 12AX7

On Tue, 3 Jun 1997, William Hawkins wrote:

> Anybody out there with a working Tektronix 570 curve tracer for tubes?  
> There's been a discussion of tube ratings following the discovery that  
> some handbook said a 12AX7 was good for 7.5 watts dissipation.

NO! Not dissipation:...OUTPUT!...in class B push-pull.

> Most  
> other books disagree, but the 12AU7 is good for 5+ watts with both  
> sections dissipating half that.

>

And the 12BH7 has about 3 times the plate area of the 12AX7. I looked last night. Further, all the tubes discussed here have the same base diagram so that one could wire up an amp as I discussed here a few days ago, and plug them all in one at a time and test them...which I intend to do.

Ken W7EKB

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Date: Sun, 1 Jun 1997 22:42:00 GMT  
**From:** ralph.hartwell@emachine.com (Ralph Hartwell)  
**Subject:** Electrolytic caps. needed

K>It looks like I am going to have to replace all of the electrolytic  
K>caps. in the power-supply circuits of my children's HW-16 and would

K>I am considering buying some of those photoflash type caps., but am  
K>wondering how they would react to continuous use at full working  
K>voltage. Does anyone here have experience along these lines?

Ken,

As I recall, many flash caps do not have good ESR values, and may possibly overheat or explode when used in filter circuits due to the AC component of the applied voltage. Additionally, because of the poor ESR, they may not eliminate the hum very well.

Ralph  
W5JGV

- ---

p QMPro 1.52 p Religious Error: (A)tone (R)epent (B)lame Satan

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Date: Wed, 04 Jun 1997 22:39:16 +1000  
**From:** Murray Kelly <mkelly@faraday.dialix.com.au>  
**Subject:** Re: High voltage in a PC power supply (was: Re: Electrolytic caps. needed...)

Mmmmm. The 5V is rectified and smoothed normally, then fed back to the controller chip as a sample.

I have a circuit here of \*one\* SMPS and I have used it as a reference once. I was able to determine that a rectifier and the chip had \*gone\* and replaced the diode with a 4007 even tho it's not high speed, and the chip I fluked at a local supply house. It worked.

One would still have to sample and smooth a little of the output for feedback. One would modulate that.

200W (and up) supplies are there for the asking.

I think it would make a pretty neat regulated screen supply. John Kolb wrote:

> You mean connecting the 5 V AC, 50 kHz square wave directly

> to the LV secondary winding of a near identical transformer,  
> right? Should work pretty well. I hate to work on switching power  
> supplies without a proper schematic, and that's very hard to  
> get for computer parts.

> > How about modulating the 5V, even?

> >

> Probably a little tricky to modulate the 5V AC, but the switching  
> regulator circuit should have a reference input, that you could  
> transformer couple audio into to modulate.

>

> John Kolb KK6IL

- --

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*****
*      Murray Kelly vk4aok      mkelly@faraday.dialix.com.au      *
*      29 Molonga Ter. / Graceville/ QLD. 4075/ Australia      *
*                        ph/fax Intl+ 61 7 3379 3307      *
*****
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Date: Wed, 4 Jun 1997 08:46:33 -0400 (EDT)

From: EWoodman@aol.com

Subject: Lorenz Type Coils

Shane,

I saw you mention that you have used some Lorenz-type coils in your  
transmitter. I've always liked the looks of those. Do the standard coil  
winding formulas work for this type of coil?

73 Eric KA1YRV

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Date: Wed, 4 Jun 1997 09:23:23 +0000

From: "Brian Carling, Radio AF4K" <bry@mnsinc.com>

Subject: Re: 6L6 voltage

Conard - how many WATTS did you get out of the 6L6 glowbug with 500  
Volts on the plate?

Just curious!

Bry

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*****
*** 73 from Radio AF4K/G3XLQ Gaithersburg, MD USA *
** E-mail to: bry@mnsinc.com *
*** See the interesting ham radio resources at: *
** http://www.mnsinc.com/bry/ *
*****
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Date: Wed, 4 Jun 1997 09:23:24 +0000

From: "Brian Carling, Radio AF4K" <bry@mnsinc.com>

Subject: Re: Electrolytic caps. needed

On 1 Jun 97 at 22:42, Ralph Hartwell spoke about Electrolytic caps.

needed and said:

> K>It looks like I am going to have to replace all of the  
> electrolytic K>caps. in the power-supply circuits of my children's  
> HW-16 and would  
>  
> K>I am considering buying some of those photoflash type caps., but  
> am K>wondering how they would react to continuous use at full  
> working K>voltage. Does anyone here have experience along these  
> lines?  
>  
> Ken,  
>  
> As I recall, many flash caps do not have good ESR values, and may  
> possibly overheat or explode when used in filter circuits due to the  
> AC component of the applied voltage. Additionally, because of the  
> poor ESR, they may not eliminate the hum very well.  
>  
> Ralph  
> W5JGV

E.S.R.? You gonna have to help us uninitiated ones here Ralph!

Let's see... Extra Simple Radio?

Every Schematic Reeks?

Electrolytic Squeaking Ratio?

Extra Strong Radials?

(grin)

For more jokes see:

<http://www.mnsinc.com/bry/jokes.htm>

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Date: Wed, 4 Jun 1997 09:31:20 -0600  
From: **dfrancis@iex.net (Dexter Francis)**  
Subject: **Computer Power Supplies**

I mentioned this a few weeks ago, but this seems like a good time to re-state it:

Many computer supplies are switch mode regulators that double or triple the line voltage before running it thru the chopper/modulator section. This means that there is probably a place to get 240 to 360 volts out of these little fellows, in addition to the +12 and +5. A little fiddling with the +5 regulator could probably make it yield +6 and voila! an integrated HV and LV power supply for your next gassless valve project.

- df

\* CWest Tube Sales - P.O.B. 22443 SLC, UT 84122 \*  
\* [http://www.usa.net/~dfrancis/CWest\\_Tube\\_Sales.html](http://www.usa.net/~dfrancis/CWest_Tube_Sales.html) \*  
\* e-mail to: [tubes@usa.net](mailto:tubes@usa.net) \*

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Date: Wed, 4 Jun 1997 11:22:59 -0600  
From: mack@mails.imed.com (Ray Mack)  
Subject: Re: Another neat RX. (long)

Here are answers to some of Bob Duckworth's questions:

1) I am doing this from very old memory, but here is the triode vs pentode story. Pentodes are a lot more stable due to the shielding of the extra grids. At the low frequencies you don't have to neutralize and kill VHF parasitics. As you go up in frequency, the triode is easier to tame because the problem frequency range is now the range you are trying to use. As to noise, each of those grids is a source of noise due to electron bombardment and secondary emission. The triode only has one grid, so there is less noise.

2) The best way to describe how to get the best injection is to throw some theory at you. \*All\* mixers are non-linear devices. They use the squared, cubed, fourth power, etc. terms of the active device to multiply one sine wave value by another sine wave value. The best mixers have the squared term as the dominant term by a factor of 10. JFET's are terrific mixers because for practical purposes they \*only\* have a squared term in the transfer function!

I pulled out the 1977 ARRL Handbook and turned to the vacuum tube section. It looks like bias and plate load resistance are more of a limiting factor than injection level. From the curves, the lower the plate load resistance, the more non-linear the tube will be. You also want to bias the mixer near cutoff to get the most non-linear portion of the curve.

That covers the static circuit design. Now we need to look at the injection level and how it relates to the plate load and bias. Let's look at the JFET as an example. You have probably noticed that the idea that having \*only\* a squared term \*guarantees\* distortion from a JFET RF amplifier. This is correct, but if you bias higher up the curve and keep the signal swing small you have a very close approximation to a straight line.

Here is the trade-off on injection level: the more non-linear the transfer curve the less injection you need. and vice-versa. This effects conversion gain. The less non-linear, the less IF output you get with more feedthrough of the oscillator and RF which you must then filter out.

I don't have my tube manual here at work, so I can't give you some good values for the bias, load and injection for these particular tubes. I'll try to look tonight.

3) The coupling at 1600 KC will determine whether you have a single hump or double hump in the response. Over coupling will cause the double hump. You don't want a single crystal at 1600 KC unless you are only interested in CW. Even at this high frequency a single crystal will give a pretty narrow filter. You can try this with a Heath HR-10B by taking out one crystal and substituting a phasing capacitor. This IF basically provides a rudimentary roofing filter and image protection. Its only purpose is to make the response as big as a barn door instead of as broad as a barn. You probably want to shoot for about 6 KC to 10 KC of response at this stage if you want to listen to AM broadcasts. If you want Hi-Fi AM you might struggle to make it 20 KC wide by dithering with coupling and tuning of the 2 circuits of the transformer.

4) I hope I read this question correctly. The short answer is to put most

(3/4??) of the gain at the low IF and as little as possible ahead of it. You really don't need any gain at the RF stage and 1st mixer for HF. The rest of the gain goes at audio.

The textbook answer to how much IF gain is necessary is "it depends". The place to start is back a little farther. You need to take the size of the minimum discernable signal (related to the noise figure and worst case noise at the antenna terminals) and figure out how much power you want at the speaker. The difference is the total gain needed in the system. There have been several good articles over the years in QEX and Ham Radio on gain distribution in a receiver.

Uhlich Rohde wrote most of them. Even the latest versions of the ARRL handbook do a fairly good job on this subject.

A thumbnail sketch looks like this:

- a) put no more than about 20 dB of gain ahead of the narrowest filter. This keeps signals within the passband of the 1600 KC section but outside the passband of the low IF from overloading the 1600KC section.
- b) aim for about -40dBm out of the detector for the minimum discernable signal. This is about 2.2 mV RMS into 50 ohms or 31 mV into 10K.
- c) The above gives about 40 to 50 dB of gain needed in the IF to be able to receive a -100dBm signal at the antenna terminals. If I remember correctly this is pretty close to the limit for low HF (40meters).

I hope this has been useful.

Ray Mack  
WD5IFS  
mack@mails.imed.com  
Friendswood (Houston), TX

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Reply Separator

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<snip>

1)

Circuit starts with a 6BJ6 Pentode as RF amp. Plug in coils for each band. Antenna link coupled to grid coil which is tuned by one of three sections of the 5-23mmf/section VFO cap. RF gain via cathode bias pot.

Mosley manual said triode amp is better on high bands owing to noise considerations. Real feature or just making what they used look good?

<snip>

2)

How to determine best VFO injection level?

<snip>

3)

Here I'm curious as to how to determine whether or not the amount of coupling I have is right, too much, or not enough. Would a 1600kc xtal (there is one in the junk box) be too tight as a filter or attenuate the signal too much at this stage of the RX?

<snip>

4)

Deja-vu, the second IF amp which is followed by the third of the triplet of transformers. The newly shaped IF signal is then routed to either a 6BE6 product detector or 1/2 of a 12AU7 double triode as envelope detector. Both IF gains are via one cathode bias pot.

As an operator, what is a good way to tell how much IF gain



is enough.

<snip>  
- -bob

---

Date: Wed, 4 Jun 1997 17:21:24 +0000  
From: "Brian Carling, Radio AF4K" <bry@mnsinc.com>  
Subject: Mic. connectors

In abind for one of those "BOATANCHOR" type screw-on microphone plugs?

You kow, the kind that Heath and others used to us, with a center pin that is littl emore than a "nub" about 3/32" across, and a screw on shield ring that is about 1/2" threads?

Well, this is amazing but I read in a n old Hints and Kinks, that you can use a PL-259 plug for on e of those things in a pinch!

Now some of these were spring loaded plugs, others not, but all used the same size threads and pin scheme with one single center conductor pin, usually in some sort of bakelite slug.

They say you just cut off most of the center pin and it will screw right on to the mic. connector!

I haven't tried thise but it sounded like a good wheeze!  
On my DX-60 the previous owner took out that panel jack and put in a more "modern" 4 pin jack of the type used on the 1970s era rice boxes like the FT-101 series etc.

Any comments? Bry, AF4K  
\*\*\*\*\*  
\*\*\* 73 from Radio AF4K/G3XLQ Gaithersburg, MD USA \*  
\*\* E-mail to: bry@mnsinc.com \*  
\*\*\* See the interesting ham radio resources at: \*  
\*\* <http://www.mnsinc.com/bry/> \*  
\*\*\*\*\*

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Date: Wed, 4 Jun 1997 17:21:24 +0000  
From: "Brian Carling, Radio AF4K" <bry@mnsinc.com>  
Subject: Re: Computer Power Supplies

On 4 Jun 97 at 9:31, Dexter Francis spoke about Computer Power Supplies and said:

> Many computer supplies are switch mode regulators that double or  
> triple the line voltage before running it thru the  
> chopper/modulation section. This means that there is probably a  
> place to get 240 to 360 volts out of these little fellows, in  
> addition to the +12 and +5. A little fiddling with the +5 regulator  
> could probably make it yield +6 and voila! an integrated HV and LV  
> power supply for your next gassless valve project.

Yes, IF you can stand the QRM from that darn switching mode supply that will likely appear in your receiver!

Any time a computer is on the same room with most sensitive HF receivers I have tried you will often get a BUZZ every 50 kHz or so up and down all of the HF bands!!

\*\*\*\*\*  
\*\*\* 73 from Radio AF4K/G3XLQ Gaithersburg, MD USA \*  
\*\* E-mail to: bry@mnsinc.com \*  
\*\*\* See the interesting ham radio resources at: \*  
\*\* <http://www.mnsinc.com/bry/> \*  
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Date: Wed, 4 Jun 1997 18:33:16 -0400 (EDT)  
From: "Walter L. Marshall" <wmarshall@CapAccess.org>  
Subject: Re: Mic. connectors

That's what I do. Works fine.  
Walter

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Date: Wed, 4 Jun 1997 18:34:22 -0400 (EDT)  
From: "Walter L. Marshall" <wmarshall@CapAccess.org>  
Subject: Re: Mic. connectors

I also file the end smooth.  
Walter

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Date: Wed, 4 Jun 1997 18:59:48 -0500 (CDT)  
From: Bob Roehrig <broehrig@admin.aurora.edu>  
Subject: Re: Computer Power Supplies

On Wed, 4 Jun 1997, Brian Carling, Radio AF4K wrote:

>  
> Any time a computer is on the same room with most sensitive HF  
> receivers I have tried you will often get a BUZZ every 50 kHz or so  
> up and down all of the HF bands!!

A good deal of the computer generated RF is from the monitor. Stuff can also leak out the serial ports and any other connector cable attached to the PC. Most printers also have switching supplies and are usually plastic cased and as a result can radiate much worse than the PC itself.

A lot of the PC generated garbage can be reduced by wrapping the attached cords thru toroid cores.

E-mail [broehrig@admin.aurora.edu](mailto:broehrig@admin.aurora.edu) 73 de Bob, K9EUI  
CIS: Data / Telecom Aurora University, Aurora, IL  
630-844-4898 Fax 630-844-5530

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Date: Wed, 4 Jun 1997 17:16:37 -0700 (PDT)

**From:** Ken Gordon <keng@uidaho.edu>  
**Subject:** FT-243 to HC-6

Oops! Got it the wrong way around. Sorry. Many years ago, I had an adapter made out of a small piece of rectangular lucite. It had two of the small HC-6 size pins mounted in it and two FT-243 size holes drilled along side of the HC-6 pins. Just plug the FT-243 into it and then plug it into the transmitter. Shouldn't be too hard to make one if you have access to a drill press, a couple of nails the same diameter as the HC-6 pins, and a bit of lucite.

Ken W7EKB

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**Date:** Wed, 4 Jun 1997 21:32:19 -0500 (CDT)  
**From:** wbfim@echo.sound.net  
**Subject:** MANUAL NEEDED

I just received a regen set in very good condition but I in dire need of a manual for it. I hope some one can help.

It is a Federal telephone and Radio Corp. Model No RC 123. It tunes from 15 kcs to 650 kcs. The contract says that it was made for the Coast Guard.

Thanks for your time

Dennis

KE0QM

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**Date:** Wed, 4 Jun 1997 21:32:23 -0500 (CDT)  
**From:** wbfim@echo.sound.net  
**Subject:** SCRAP BOOK BY W2IMB

I am looking to make a collection of 'The low and medium frequency radio scrap book' by W2IMB.

I would take originals or copies. I have the 3rd, 7th, and 9th editions.

Thanks and 73/72

Dennis

KE0QM

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**Date:** Wed, 4 Jun 1997 22:35:40 -0600 (MDT)  
**From:** toyboat@freenet.edmonton.ab.ca  
**Subject:** Re: Lorenz Type Coils

On Wed, 4 Jun 1997 EWoodman@aol.com wrote:

> Shane,  
> I saw you mention that you have used some Lorenz-type coils in your

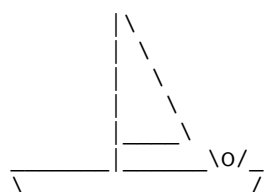
> transmitter. I've always liked the looks of those. Do the standard coil  
> winding formulas work for this type of coil?  
>  
> 73 Eric KA1YRV  
>

An excellent question! Unfortunately, I have not the foggiest idea.  
Considering the weird woven geometric pattern of them, I doubt that  
any simple solenoid coil formula would adapt. I simply used the  
published project data.

I do know that they have excellent Q, are very easy to wind, and work  
just fine. They slide off the dowels easy, yet can be positioned  
easily and firmly. I glued my dowels into the wooden chassis and  
made a removable tensioner top cap of a 3" X 1/2" circle of poplar,  
drilled with matching holes for the dowels. I used waxed linen  
leather stitching thread (Tandy) to tie the coils.

Perhaps someone else can come up with the formulas for these?  
I'd like to know them myself.

Regards,



~~~~~  
Shane <toyboat@freenet.edmonton.ab.ca>  
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End of glowbugs V1 #51  
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[AB4EL Ham Radio Homepage @ SunSITE](#)

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Created by **Steve Modena, AB4EL**  
Comments and suggestions to [modena@SunSITE.unc.edu](mailto:modena@SunSITE.unc.edu)

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